

**MEMORANDUM**

**Shaw Environmental and Infrastructure, Inc.**  
**Contract No. EP-C-08-034**

**In reply refer to: 11-LH-22A**

**To:** Cindy Paul  
Dennis Miller

**From:** Lisa Hudson

**Lab:** GC

**Thru:** Sujith Kumar  
John Cox

**Date:** 6/28/11

**Technical Directive:** 70A767SF  
**Task No.:** 23993

**Originator:** Rick Wilkin  
**Copies:** Rick Wilkin  
Steve Vandegrift  
Lisa Hudson  
John Cox

**Project/Sample Site:** Pavillion Groundwater

**Date Collected:** 4/18-21/11

**Date Received:** 4/21-22/11

**Date Analyzed:** 6/27-28/2011

**No. Samples Analyzed:** 3

**Shaw Sample Set No.:** 6030, 6032

**Sample Matrix:** Water

**Analysis Type:** Dissolved Gas

**Sample Preparation:** Not applicable

**Method(s) Used :** RSKSOP-194 rev4 Gas Analysis by Micro Gas Chromatograph  
RSKSOP-175 rev5 Sample Preparation and Calculations for Dissolved Gas  
Analysis in Water Samples Using a GC Headspace Equilibration Technique

**Comments:** All QC results met criteria established in RSKSOP-194, and RSKSOP-175.

No lab duplicates were analyzed due to lack of sample. These samples were re-analyzed with argon blanks before each sample to demonstrate that the analytical system contained no detectable analytes. The argon blank prior to the sample was blank for all three re-analyses.

NOTE: Sample 6030-15 was broken in transit and a spare 40 ml vial substituted. Detection limits utilizing 40 mls instead of 60 mls will be higher.

	A	B	C	D	E	F	G	H	I	J	K
1										Method	HLC
2	Gas	CAS #	mol. wt.	A	B	C	D	T, °C	Quant limit (ppm) *	Det. Limit (ppm) *	atm mol fraction
3	Methane	74-82-8	16	-365.183	18106.7	49.7554	-0.00028503	25	10.0	1.47	39,769
4	Ethane	74-84-0	30	-533.392	26565.0	74.6240	-0.00457313	25	10.0	2.65	29,771
5	Propane	74-98-6	44	-628.866	31638.4	88.0808	0.00000000	25	10.0	2.05	36,809
6	n-Butane	106-97-8	58	-639.209	32785.7	89.1483	0.00000000	25	10.0	1.99	45,275
7											
8											
9											
10											
11											
12			ppm	ppm (syr dil corr)		ppm	ppm (syr dil corr)		ppm	ppm (syr dil corr)	
13	Sample	sample ID	Methane	Methane	PPG	Ethane	Ethane	PPG	Propane	Propane	PPG
14	Trip Blank	s	129.659	195.840	1.918E-04	194.268	293.426	2.874E-04	0.000	0.000	0.00E+00
15	Blank	s	134.902	207.013	2.324E-04	200.652	307.910	3.456E-04	0.000	0.000	0.00E+00
16	Field Blank	s	0.000	0.000	0.000E+00	0.000	0.000	0.000E+00	0.000	0.000	0.00E+00
17											
18											
19											
20											
21											
22											
23											
24											
25											

	L	M	N	R	S	T	U	V	W	X
1										
2										
3										
4										
5										
6										
7										
8										
9										
10									headspace	
11							headspace	instrument	dilution	
12	ppm	ppm (styr dil corr)			sample		gas volume	injection	injection	
13	n-Butane	n-Butane	PPG	T C	pressure, psi	Bottle vol, mL	mL	volume mL	volume mL	
14	0.000	0.000	0.00E+00	23.0	-0.3	60.0	6.0	3.0	3.0	
15	0.000	0.000	0.00E+00	23.0	1.8	40.0	5.0	3.0	3.0	
16	0.000	0.000	0.00E+00	23.0	-0.2	60.0	6.0	3.0	3.0	
17										
18										
19										
20										
21										
22										
23										
24										
25										

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	
1																				
2		Shaw Environmental and Infrastructure, Inc.																		
3		Analytical Service Results Report																		
4																				
5																				
6		Laboratory:	GC		Report Date:	6/28/11														
7																				
8		Technical Directive:	70A767SF																	
9																				
10		Analyst:	Lisa Hudson		Analytes				Methane			Ethane			Propane			n-Butane		
11					CAS #				74-82-8			74-84-0			74-98-6			106-97-8		
12		Method:	RSKSOP-175, RSKSOP-194		Unit				ppm, v/v in gas			ppm, v/v in gas			ppm, v/v in gas			ppm, v/v in gas		
13		Lab Sample ID	Date Collected	Date Analyzed	Field Sample ID	SyrDilCorr	MDL	QL	Data	MDL *	QL *	Data	MDL *	QL *	Data	MDL *	QL *	Data		
14		6030-9	4/14/2011	6/27/2011	Trip Blank	1.510	2.22	15.10	196	4.00	15.1	293	3.096	15.1	ND	3.01	15.1	ND		
15		6030-15	4/18/2011	6/28/2011	Blank	1.535	2.26	15.35	207	4.07	15.3	308	3.146	15.3	ND	3.05	15.3	ND		
16		6032-5	4/21/2000	6/27/2011	Field Blank	1.507	2.22	15.07	ND	3.99	15.1	ND	3.089	15.1	ND	3.00	15.1	ND		
17																				
18		1. If the parameter was detected above the quantitation limit (QL), the numeric result is reported; BQL denotes that the parameter was not detected at or above the quantitation limit; BQL ( ) denotes that the parameter was detected above the method detection limit (MDL) but below QL and the estimated numeric result is reported in parenthesis; ND denotes that the parameter was not detected at all. All the results are corrected with dilution factors (DF), if applicable.																		
19																				
20																				
21		2. "-" denotes that the information is not available or the analyte is not analyzed.																		
22		3. When there is pressure in the sample, the values of the QL and MDL for the dissolved gas concentration (mg/L) change.																		
23																				
24																				
25																				

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM
1																		
2	Shaw Environmental and Infrastructure, Inc.																	
3	Analytical Service Results Report																	
4																		
5			Report Date:	6/28/11														
6	Laboratory:	GC																
7																		
8	Technical Directive:	70A767SF																
9																		
10	Analyst:	Lisa Hudson		Analytes					Methane			Ethane			Propane			n-Butane
11				CAS #					74-82-8			74-84-0			74-98-6			106-97-8
12	Method:	RSKSOP-175, RSKSOP-194		Unit					µg/L, in water			µg/L, in water			µg/L, in water			µg/L, in water
13	Lab Sample ID	Date Collected	Date Analyzed	Field Sample ID	SyrDilCorr	p <sub>hs</sub> (atm)	MDL *	QL *	Data	MDL *	QL *	Data	MDL *	QL *	Data	MDL *	QL *	Data
14	6030-9	4/14/11	6/27/11	Trip Blank	1.510	0.980	0.317	2.16	18.5	1.16	4.38	56.4	1.245	6.07	ND	1.53	7.63	ND
15	6030-15	4/18/11	6/28/11	Blank	1.535	1.12	0.456	3.10	27.2	1.64	6.21	81.3	1.780	8.70	ND	2.19	11.0	ND
16	6032-5	4/21/00	6/27/11	Field Blank	1.507	0.986	0.316	2.15	ND	1.16	4.40	ND	1.248	6.09	ND	1.52	7.66	ND
17																		
18	1. If the parameter was detected above the quantitation limit (QL), the numeric result is reported; BQL denotes that the parameter was not detected at or above the quantitation limit; BQL ( )																	
19	denotes that the parameter was detected above the method detection limit (MDL) but below QL and the estimated numeric result is reported in parenthesis; ND denotes that the parameter was not																	
20	detected at all. All the results are corrected with dilution factors (DF), if applicable.																	
21	2. "-" denotes that the information is not available or the analyte is not analyzed.																	
22	3. "" denotes that the MDL and QL values presented here are for the cases where no pressure is found in the sample and where no dilution of the sample is made.																	
23	4. When there is pressure in the sample and when the sample is diluted, the values of the QL and MDL for the dissolved gas concentration (mg/L) change. When expressed as gas concentration																	
24	(ppm), dilution of the sample but not sample pressure changes the QL and MDL.																	
25	5. SyrDilCorr is the correction to the measured concentration that is applied when a dilution is done. $SyrDilCorr = (1 + (Vdil * p1atm / (Vhs * (1 atm + p_{gauge} / 14.7psi/atm))))$																	

	A	B	C	D	E	F	G	H	I
1	<b>Shaw Environmental and Infrastructure, Inc.</b>								
2	<b>Analytical Service Results Report</b>								
3									
4	<b>Laboratory:</b>	GC	<b>Report Date:</b>	6/28/11					
5									
6	<b>Technical Directive:</b>	70A767SF							
7									
8	<b>Analyst:</b>	Lisa Hudson		<b>Lab Sample ID</b>		6030-9	6030-15	6032-5	
9				<b>Date Collected</b>		4/14/2011	4/18/2011	4/21/2011	
10				<b>Temperature °C</b>		23.0	23.0	23.0	
11				<b>Pressure, psi</b>		-0.3	1.8	-0.2	
12				<b>Date Analyzed</b>		6/27/2011	6/28/2011	6/27/2011	
13				<b>Sample Name</b>		Trip Blank	Blank	Field Blank	
14	<b>Analytes</b>		<b>CAS #</b>	<b>Unit</b>	<b>MDL</b>	<b>QL</b>	<b>Data</b>		<b>Data</b>
15	Methane		74-82-8	ppm	1.47	10.0	130	135	ND
16	Ethane		74-84-0	ppm	2.65	10.0	194	201	ND
17	Propane		74-98-6	ppm	2.05	10.0	ND	ND	ND
18	i-Butane		7553-56-2	ppm	10.0*	10.0*	ND	ND	ND
19	n-Butane		106-97-8	ppm	1.99	10.0	ND	ND	ND
20	dilution factor		-	-	-	-	1	1	1
21									
22	<b>Comments:</b>								
23	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported represent those completed on January 13, 2011. *Estimated value.								
24	1. If the parameter was detected above the quantitation limit ( <b>QL</b> ), the numeric result is reported; <b>BQL</b> denotes that the parameter was not detected at or above the quantitation limit; <b>BQL</b> ( ) denotes that the parameter was detected above the method detection limit ( <b>MDL</b> ) but below <b>QL</b> and the estimated numeric result is reported in parenthesis; <b>ND</b> denotes that the parameter was not detected at all. All the results are corrected with dilution factors ( <b>DF</b> ), if applicable.								
25									
26									
27	2. "-" denotes that the information is not available or the analyte is not analyzed.								

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Shaw Environmental and Infrastructure, Inc.													
2	Analytical Service Results Report													
3														
4	Laboratory:	GC		Report Date:	6/28/11									
5														
6	Technical Directive:	70A767SF												
7														
8	Analyst:	Lisa Hudson		QC Sample ID	Argon Blank			Argon Blank			Argon Blank			
9				Additional ID	GB			GB			GB			
10				Date Prepared	6/27/11			6/27/11			6/27/11			
11				Date Analyzed	6/27/11			6/27/11			6/27/11			
12	Analytes		Unit	MDL	QL	Data	True Values	% Rec.	Data	True Values	% Rec.	Data	True Values	% Rec.
13	Names	CAS #												
14	Methane	74-82-8	ppm	1.47	10.0	ND	-	-	ND	-	-	ND	-	-
15	Ethane	74-84-0	ppm	2.65	10.0	ND	-	-	ND	-	-	ND	-	-
16	Propane	74-98-6	ppm	2.05	10.0	ND	-	-	ND	-	-	ND	-	-
17	i-Butane	7553-56-2	ppm	10.0*	10.0*	ND	-	-	ND	-	-	ND	-	-
18	n-Butane	106-97-8	ppm	1.99	10.0	ND	-	-	ND	-	-	ND	-	-
19	dilution factor	-	-	-	-	-	1	-	-	1	-	-	1	-
20														
21	Comments:													
22	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported													
23	represent those completed on January 13, 2011. *Estimated values.													
24	Notes:													
25	1. MB - Method Blank. GB - Gas Blanks. CCC - Continuing Calibration Check. A calibration standard													
26	analyzed within the batch of samples. LCS - Laboratory Control Spike. A laboratory blank spiked with													
27	analytes at known concentrations. MS - Matrix Spike. A field sample spiked with known concentrations of													
28	analytes. The field sample id is identified. SS - Samples obtained from a second source. DUP - Field													
29	sample duplicate analysis. A sample selected by the lab analyst to analyze as a duplicate. It is reported													
30	in the sample result section. % REC - Percent Recovery. Calculated as the percentage of the results to													
	the true value. It equals to % recovery for CCC.													
	2. "-" denotes that the information is not available or the analyte is not analyzed.													



	A	B	C	D	E	O	P	Q	R	S	T	U	V	W
1	Shaw Environmental and Infrastructure, Inc.													
2	Analytical Service Results Report													
3														
4	Laboratory:	GC		Report Date:	6/28/11									
5														
6	Technical Directive:	70A767SF												
7														
8	Analyst:	Lisa Hudson		QC Sample ID		Water Blank			Refinery Gas #2			Refinery Gas #2		
9				Additional ID		MB			CCC			SS		
10				Date Prepared		6/27/11			7/8/10			5/13/10		
11				Date Analyzed		6/27/11			6/27/11			6/27/11		
12	Analytes													
13	Names	CAS #	Unit	MDL	QL	Data	True Values	% Rec.	Data	True Values	% Rec.	Data	True Values	% Rec.
14	Methane	74-82-8	ppm	1.47	10.0	ND	-	-	48400	50080	96.6	50500	50080	101
15	Ethane	74-84-0	ppm	2.65	10.0	ND	-	-	42200	40120	105	42700	40120	106
16	Propane	74-98-6	ppm	2.05	10.0	ND	-	-	55300	60150	91.9	55500	60150	92.3
17	i-Butane	7553-56-2	ppm	10.0*	10.0*	ND	-	-	46900	50180	93.5	47100	50180	93.9
18	n-Butane	106-97-8	ppm	1.99	10.0	ND	-	-	38700	40220	96.2	38800	40220	96.5
19	dilution factor	-	-	-	-	-	1	-	-	1	-	-	1	-
20														
21	Comments:													
22	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported													
23	represent those completed on January 13, 2011. *Estimated values.													
24	Notes:													
25	1. MB - Method Blank. GB - Gas Blanks. CCC - Continuing Calibration Check. A calibration standard													
26	analyzed within the batch of samples. LCS - Laboratory Control Spike. A laboratory blank spiked with													
27	analytes at known concentrations. MS - Matrix Spike. A field sample spiked with known concentrations of													
28	analytes. The field sample id is identified. SS - Samples obtained from a second source. DUP - Field													
29	sample duplicate analysis. A sample selected by the lab analyst to analyze as a duplicate. It is reported													
30	in the sample result section. % REC - Percent Recovery. Calculated as the percentage of the results to													
	the true value. It equals to % recovery for CCC.													
	2. "-" denotes that the information is not available or the analyte is not analyzed.													

	A	B	C	D	E	X	Y	Z	AA	AB	AC	AD	AE	AF
1	Shaw Environmental and Infrastructure, Inc.													
2	Analytical Service Results Report													
3														
4	Laboratory:	GC		Report Date:	6/28/11									
5														
6	Technical Directive:	70A767SF												
7														
8	Analyst:	Lisa Hudson		QC Sample ID		Argon Blank			Argon Blank			Argon Blank		
9				Additional ID		GB			GB			GB		
10				Date Prepared		6/27/11			6/27/11			6/27/11		
11				Date Analyzed		6/27/11			6/27/11			6/27/11		
12	Analytes													
13	Names	CAS #	Unit	MDL	QL	Data	True Values	% Rec.	Data	True Values	% Rec.	Data	True Values	% Rec.
14	Methane	74-82-8	ppm	1.47	10.0	ND	-	-	ND	-	-	ND	-	-
15	Ethane	74-84-0	ppm	2.65	10.0	ND	-	-	ND	-	-	ND	-	-
16	Propane	74-98-6	ppm	2.05	10.0	ND	-	-	ND	-	-	ND	-	-
17	i-Butane	7553-56-2	ppm	10.0*	10.0*	ND	-	-	ND	-	-	ND	-	-
18	n-Butane	106-97-8	ppm	1.99	10.0	ND	-	-	ND	-	-	ND	-	-
19	dilution factor	-	-	-	-	-	1	-	-	1	-	-	1	-
20														
21	Comments:													
22	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported													
23	represent those completed on January 13, 2011. *Estimated values.													
24	Notes:													
25	1. MB - Method Blank. GB - Gas Blanks. CCC - Continuing Calibration Check. A calibration standard													
26	analyzed within the batch of samples. LCS - Laboratory Control Spike. A laboratory blank spiked with													
27	analytes at known concentrations. MS - Matrix Spike. A field sample spiked with known concentrations of													
28	analytes. The field sample id is identified. SS - Samples obtained from a second source. DUP - Field													
29	sample duplicate analysis. A sample selected by the lab analyst to analyze as a duplicate. It is reported													
30	in the sample result section. % REC - Percent Recovery. Calculated as the percentage of the results to													
	the true values. It equals to % recovery for CCC.													
	2. "-" denotes that the information is not available or the analyte is not analyzed.													

	A	B	C	D	E	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1	Shaw Environmental and Infrastructure, Inc.													
2	Analytical Service Results Report													
3														
4	Laboratory:	GC		Report Date:	6/28/11									
5														
6	Technical Directive:	70A767SF												
7														
8	Analyst:	Lisa Hudson		QC Sample ID		Argon Blank			Argon Blank			Argon Blank		
9				Additional ID		GB			GB			GB		
10				Date Prepared		6/27/11			6/27/11			6/27/11		
11				Date Analyzed		6/27/11			6/27/11			6/27/11		
12	Analytes													
13	Names	CAS #	Unit	MDL	QL	Data	True Values	% Rec.	Data	True Values	% Rec.	Data	True Values	% Rec.
14	Methane	74-82-8	ppm	1.47	10.0	ND	-	-	ND	-	-	ND	-	-
15	Ethane	74-84-0	ppm	2.65	10.0	ND	-	-	ND	-	-	ND	-	-
16	Propane	74-98-6	ppm	2.05	10.0	ND	-	-	ND	-	-	ND	-	-
17	i-Butane	7553-56-2	ppm	10.0*	10.0*	ND	-	-	ND	-	-	ND	-	-
18	n-Butane	106-97-8	ppm	1.99	10.0	ND	-	-	ND	-	-	ND	-	-
19	dilution factor	-	-	-	-	-	1	-	-	1	-	-	1	-
20														
21	Comments:													
22	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported													
23	represent those completed on January 13, 2011. *Estimated values.													
24	Notes:													
25	1. MB - Method Blank. GB - Gas Blanks. CCC - Continuing Calibration Check. A calibration standard													
26	analyzed within the batch of samples. LCS - Laboratory Control Spike. A laboratory blank spiked with													
27	analytes at known concentrations. MS - Matrix Spike. A field sample spiked with known concentrations of													
28	analytes. The field sample id is identified. SS - Samples obtained from a second source. DUP - Field													
29	sample duplicate analysis. A sample selected by the lab analyst to analyze as a duplicate. It is reported													
30	in the sample result section. % REC - Percent Recovery. Calculated as the percentage of the results to													
	the true value. It equals to % recovery for CCC.													
	2. "-" denotes that the information is not available or the analyte is not analyzed.													

	A	B	C	D	E	AP	AQ	AR	AS	AT	AU	AV	AW	AX
1	Shaw Environmental and Infrastructure, Inc.													
2	Analytical Service Results Report													
3														
4	Laboratory:	GC		Report Date:	6/28/11									
5														
6	Technical Directive:	70A767SF												
7														
8	Analyst:	Lisa Hudson		QC Sample ID		Argon Blank			Argon Blank			Refinery Gas #2		
9				Additional ID		GB			GB			CCC		
10				Date Prepared		6/27/11			6/27/11			7/8/10		
11				Date Analyzed		6/27/11			6/27/11			6/27/11		
12	Analytes		Unit	MDL	QL	Data	True Values	% Rec.	Data	True Values	% Rec.	Data	True Values	% Rec.
13	Names	CAS #												
14	Methane	74-82-8	ppm	1.47	10.0	ND	-	-	ND	-	-	49600	50080	99.0
15	Ethane	74-84-0	ppm	2.65	10.0	ND	-	-	ND	-	-	42200	40120	105
16	Propane	74-98-6	ppm	2.05	10.0	ND	-	-	ND	-	-	62900	60150	105
17	i-Butane	7553-56-2	ppm	10.0*	10.0*	ND	-	-	ND	-	-	51800	50180	103
18	n-Butane	106-97-8	ppm	1.99	10.0	ND	-	-	ND	-	-	41200	40220	102
19	dilution factor	-	-	-	-	-	1	-	-	1	-	-	1	-
20														
21	Comments:													
22	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported													
23	represent those completed on January 13, 2011. *Estimated values.													
24	Notes:													
25	1. <b>MB</b> - Method Blank. <b>GB</b> - Gas Blanks. <b>CCC</b> - Continuing Calibration Check. A calibration standard													
26	analyzed within the batch of samples. <b>LCS</b> - Laboratory Control Spike. A laboratory blank spiked with													
27	analytes at known concentrations. <b>MS</b> - Matrix Spike. A field sample spiked with known concentrations of													
28	analytes. The field sample id is identified. <b>SS</b> - Samples obtained from a second source. <b>DUP</b> - Field													
29	sample duplicate analysis. A sample selected by the lab analyst to analyze as a duplicate. It is reported													
30	in the sample result section. <b>% REC</b> - Percent Recovery. Calculated as the percentage of the results to													
	the true values. It equals to % recovery for CCC.													
	2. "-" denotes that the information is not available or the analyte is not analyzed.													

	A	B	C	D	E	AY	AZ	BA	BB	BC	BD	BE	BF	BG
1	Shaw Environmental and Infrastructure, Inc.													
2	Analytical Service Results Report													
3														
4	Laboratory:	GC		Report Date:	6/28/11									
5														
6	Technical Directive:	70A767SF												
7														
8	Analyst:	Lisa Hudson		QC Sample ID		Argon Blank			Argon Blank			Argon Blank		
9				Additional ID		GB			GB			GB		
10				Date Prepared		6/27/11			6/27/11			6/27/11		
11				Date Analyzed		6/27/11			6/27/11			6/27/11		
12	Analytes													
13	Names	CAS #	Unit	MDL	QL	Data	True Values	% Rec.	Data	True Values	% Rec.	Data	True Values	% Rec.
14	Methane	74-82-8	ppm	1.47	10.0	ND	-	-	ND	-	-	ND	-	-
15	Ethane	74-84-0	ppm	2.65	10.0	ND	-	-	ND	-	-	ND	-	-
16	Propane	74-98-6	ppm	2.05	10.0	ND	-	-	ND	-	-	ND	-	-
17	i-Butane	7553-56-2	ppm	10.0*	10.0*	ND	-	-	ND	-	-	ND	-	-
18	n-Butane	106-97-8	ppm	1.99	10.0	ND	-	-	ND	-	-	ND	-	-
19	dilution factor	-	-	-	-	-	1	-	-	1	-	-	1	-
20														
21	Comments:													
22	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported													
23	represent those completed on January 13, 2011. *Estimated values.													
24	Notes:													
25	1. MB - Method Blank. GB - Gas Blanks. CCC - Continuing Calibration Check. A calibration standard													
26	analyzed within the batch of samples. LCS - Laboratory Control Spike. A laboratory blank spiked with													
27	analytes at known concentrations. MS - Matrix Spike. A field sample spiked with known concentrations of													
28	analytes. The field sample id is identified. SS - Samples obtained from a second source. DUP - Field													
29	sample duplicate analysis. A sample selected by the lab analyst to analyze as a duplicate. It is reported													
30	in the sample result section. % REC - Percent Recovery. Calculated as the percentage of the results to													
	the true value. It equals to % recovery for CCC.													
	2. "-" denotes that the information is not available or the analyte is not analyzed.													

	A	B	C	D	E	BH	BI	BJ	BK	BL	BM	BN	BO	BP
1	Shaw Environmental and Infrastructure, Inc.													
2	Analytical Service Results Report													
3														
4	Laboratory:	GC		Report Date:	6/28/11									
5														
6	Technical Directive:	70A767SF												
7														
8	Analyst:	Lisa Hudson		QC Sample ID		Argon Blank			Argon Blank			Argon Blank		
9				Additional ID		GB			GB			GB		
10				Date Prepared		6/28/11			6/28/11			6/28/11		
11				Date Analyzed		6/28/11			6/28/11			6/28/11		
12	Analytes													
13	Names	CAS #	Unit	MDL	QL	Data	True Values	% Rec.	Data	True Values	% Rec.	Data	True Values	% Rec.
14	Methane	74-82-8	ppm	1.47	10.0	ND	-	-	ND	-	-	ND	-	-
15	Ethane	74-84-0	ppm	2.65	10.0	ND	-	-	ND	-	-	ND	-	-
16	Propane	74-98-6	ppm	2.05	10.0	ND	-	-	ND	-	-	ND	-	-
17	i-Butane	7553-56-2	ppm	10.0*	10.0*	ND	-	-	ND	-	-	ND	-	-
18	n-Butane	106-97-8	ppm	1.99	10.0	ND	-	-	ND	-	-	ND	-	-
19	dilution factor	-	-	-	-	-	1	-	-	1	-	-	1	-
20														
21	Comments:													
22	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported													
23	represent those completed on January 13, 2011. *Estimated values.													
24	Notes:													
25	1. <b>MB</b> - Method Blank. <b>GB</b> - Gas Blanks. <b>CCC</b> - Continuing Calibration Check. A calibration standard													
26	analyzed within the batch of samples. <b>LCS</b> - Laboratory Control Spike. A laboratory blank spiked with													
27	analytes at known concentrations. <b>MS</b> - Matrix Spike. A field sample spiked with known concentrations of													
28	analytes. The field sample id is identified. <b>SS</b> - Samples obtained from a second source. <b>DUP</b> - Field													
29	sample duplicate analysis. A sample selected by the lab analyst to analyze as a duplicate. It is reported													
30	in the sample result section. <b>% REC</b> - Percent Recovery. Calculated as the percentage of the results to													
	the true values. It equals to % recovery for CCC.													
	2. "-" denotes that the information is not available or the analyte is not analyzed.													

	A	B	C	D	E	BQ	BR	BS	BT	BU	BV	BW	BX	BY
1	<b>Shaw Environmental and Infrastructure, Inc.</b>													
2	<b>Analytical Service Results Report</b>													
3														
4	<b>Laboratory:</b>	GC		<b>Report Date:</b>	6/28/11									
5														
6	<b>Technical Directive:</b>	70A767SF												
7														
8	<b>Analyst:</b>	Lisa Hudson		<b>QC Sample ID</b>	Water Blank	Refinery Gas #2			Refinery Gas #2					
9				<b>Additional ID</b>	MB	CCC			SS					
10				<b>Date Prepared</b>	6/28/11	7/8/10			5/13/10					
11				<b>Date Analyzed</b>	6/28/11	6/28/11			6/28/11					
12	<b>Analytes</b>													
13	<b>Names</b>	<b>CAS #</b>	<b>Unit</b>	<b>MDL</b>	<b>QL</b>	<b>Data</b>	<b>True Values</b>	<b>% Rec.</b>	<b>Data</b>	<b>True Values</b>	<b>% Rec.</b>	<b>Data</b>	<b>True Values</b>	<b>% Rec.</b>
14	Methane	74-82-8	ppm	1.47	10.0	ND	-	-	46100	50080	92.1	48300	50080	96.4
15	Ethane	74-84-0	ppm	2.65	10.0	ND	-	-	39900	40120	99.5	40500	40120	101
16	Propane	74-98-6	ppm	2.05	10.0	ND	-	-	61000	60150	101	56700	60150	94.3
17	i-Butane	7553-56-2	ppm	10.0*	10.0*	ND	-	-	51000	50180	102	48800	50180	97.2
18	n-Butane	106-97-8	ppm	1.99	10.0	ND	-	-	41400	40220	103	39600	40220	98.5
19	dilution factor	-	-	-	-	-	1	-	-	1	-	-	1	-
20														
21	<b>Comments:</b>													
22	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported													
23	represent those completed on January 13, 2011. *Estimated values.													
24	<b>Notes:</b>													
25	1. <b>MB</b> - Method Blank. <b>GB</b> - Gas Blanks. <b>CCC</b> - Continuing Calibration Check. A calibration standard													
26	analyzed within the batch of samples. <b>LCS</b> - Laboratory Control Spike. A laboratory blank spiked with													
27	analytes at known concentrations. <b>MS</b> - Matrix Spike. A field sample spiked with known concentrations of													
28	analytes. The field sample id is identified. <b>SS</b> - Samples obtained from a second source. <b>DUP</b> - Field													
29	sample duplicate analysis. A sample selected by the lab analyst to analyze as a duplicate. It is reported													
30	in the sample result section. <b>% REC</b> - Percent Recovery. Calculated as the percentage of the results to													
	the true value. It equals to % recovery for CCC.													
	2. "-" denotes that the information is not available or the analyte is not analyzed.													

	A	B	C	D	E	BZ	CA	CB	CC	CD	CE	CF	CG	CH
1	Shaw Environmental and Infrastructure, Inc.													
2	Analytical Service Results Report													
3														
4	Laboratory:	GC		Report Date:	6/28/11									
5														
6	Technical Directive:	70A767SF												
7														
8	Analyst:	Lisa Hudson		QC Sample ID		Argon Blank			Argon Blank			Argon Blank		
9				Additional ID		GB			GB			GB		
10				Date Prepared		6/28/11			6/28/11			6/28/11		
11				Date Analyzed		6/28/11			6/28/11			6/28/11		
12	Analytes													
13	Names	CAS #	Unit	MDL	QL	Data	True Values	% Rec.	Data	True Values	% Rec.	Data	True Values	% Rec.
14	Methane	74-82-8	ppm	1.47	10.0	ND	-	-	ND	-	-	ND	-	-
15	Ethane	74-84-0	ppm	2.65	10.0	ND	-	-	ND	-	-	ND	-	-
16	Propane	74-98-6	ppm	2.05	10.0	ND	-	-	ND	-	-	ND	-	-
17	i-Butane	7553-56-2	ppm	10.0*	10.0*	ND	-	-	ND	-	-	ND	-	-
18	n-Butane	106-97-8	ppm	1.99	10.0	ND	-	-	ND	-	-	ND	-	-
19	dilution factor	-	-	-	-	-	1	-	-	1	-	-	1	-
20														
21	Comments:													
22	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported													
23	represent those completed on January 13, 2011. *Estimated values.													
24	Notes:													
25	1. MB - Method Blank. GB - Gas Blanks. CCC - Continuing Calibration Check. A calibration standard													
26	analyzed within the batch of samples. LCS - Laboratory Control Spike. A laboratory blank spiked with													
27	analytes at known concentrations. MS - Matrix Spike. A field sample spiked with known concentrations of													
28	analytes. The field sample id is identified. SS - Samples obtained from a second source. DUP - Field													
29	sample duplicate analysis. A sample selected by the lab analyst to analyze as a duplicate. It is reported													
30	in the sample result section. % REC - Percent Recovery. Calculated as the percentage of the results to													
	the true value. It equals to % recovery for CCC.													
	2. "-" denotes that the information is not available or the analyte is not analyzed.													



	A	B	C	D	E	CI	CJ	CK	CL	CM	CN	CO	CP	CQ
1	Shaw Environmental and Infrastructure, Inc.													
2	Analytical Service Results Report													
3														
4	Laboratory:	GC		Report Date:	6/28/11									
5														
6	Technical Directive:	70A767SF												
7														
8	Analyst:	Lisa Hudson		QC Sample ID		Argon Blank			Argon Blank			Argon Blank		
9				Additional ID		GB			GB			GB		
10				Date Prepared		6/28/11			6/28/11			6/28/11		
11				Date Analyzed		6/28/11			6/28/11			6/28/11		
12	Analytes													
13	Names	CAS #	Unit	MDL	QL	Data	True Values	% Rec.	Data	True Values	% Rec.	Data	True Values	% Rec.
14	Methane	74-82-8	ppm	1.47	10.0	ND	-	-	ND	-	-	ND	-	-
15	Ethane	74-84-0	ppm	2.65	10.0	ND	-	-	ND	-	-	ND	-	-
16	Propane	74-98-6	ppm	2.05	10.0	ND	-	-	ND	-	-	ND	-	-
17	i-Butane	7553-56-2	ppm	10.0*	10.0*	ND	-	-	ND	-	-	ND	-	-
18	n-Butane	106-97-8	ppm	1.99	10.0	ND	-	-	ND	-	-	ND	-	-
19	dilution factor	-	-	-	-	-	1	-	-	1	-	-	1	-
20														
21	Comments:													
22	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported													
23	represent those completed on January 13, 2011. *Estimated values.													
24	Notes:													
25	1. MB - Method Blank. GB - Gas Blanks. CCC - Continuing Calibration Check. A calibration standard													
26	analyzed within the batch of samples. LCS - Laboratory Control Spike. A laboratory blank spiked with													
27	analytes at known concentrations. MS - Matrix Spike. A field sample spiked with known concentrations of													
28	analytes. The field sample id is identified. SS - Samples obtained from a second source. DUP - Field													
29	sample duplicate analysis. A sample selected by the lab analyst to analyze as a duplicate. It is reported													
30	in the sample result section. % REC - Percent Recovery. Calculated as the percentage of the results to													
	the true value. It equals to % recovery for CCC.													
	2. "-" denotes that the information is not available or the analyte is not analyzed.													

	A	B	C	D	E	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC
1	Shaw Environmental and Infrastructure, Inc.																
2	Analytical Service Results Report																
3																	
4	Laboratory:	GC		Report Date:	6/28/11												
5																	
6	Technical Directive:	70A767SF															
7																	
8	Analyst:	Lisa Hudson		QC Sample ID	Refinery Gas #2	Argon Blank			Argon Blank			Argon Blank			Argon Blank		
9				Additional ID	CCC	GB			GB			GB			GB		
10				Date Prepared	7/8/10	6/28/11			6/28/11			6/28/11			6/28/11		
11				Date Analyzed	6/28/11	6/28/11			6/28/11			6/28/11			6/28/11		
12	Analytes																
13	Names	CAS #	Unit	MDL	QL	Data	True Values	% Rec.	Data	True Values	% Rec.	Data	True Values	% Rec.	Data	True Values	% Rec.
14	Methane	74-82-8	ppm	1.47	10.0	47900	50080	95.6	ND	-	-	ND	-	-	ND	-	-
15	Ethane	74-84-0	ppm	2.65	10.0	40800	40120	102	ND	-	-	ND	-	-	ND	-	-
16	Propane	74-98-6	ppm	2.05	10.0	57600	60150	95.8	ND	-	-	ND	-	-	ND	-	-
17	i-Butane	7553-56-2	ppm	10.0*	10.0*	49300	50180	98.2	ND	-	-	ND	-	-	ND	-	-
18	n-Butane	106-97-8	ppm	1.99	10.0	40000	40220	99.5	ND	-	-	ND	-	-	ND	-	-
19	dilution factor	-	-	-	-	-	1	-	-	1	-	-	1	-	-	1	-
20																	
21	Comments:																
22	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported																
23	represent those completed on January 13, 2011. *Estimated values.																
24	Notes:																
25	1. MB - Method Blank. GB - Gas Blanks. CCC - Continuing Calibration Check. A calibration standard																
26	analyzed within the batch of samples. LCS - Laboratory Control Spike. A laboratory blank spiked with																
27	analytes at known concentrations. MS - Matrix Spike. A field sample spiked with known concentrations of																
28	analytes. The field sample id is identified. SS - Samples obtained from a second source. DUP - Field																
29	sample duplicate analysis. A sample selected by the lab analyst to analyze as a duplicate. It is reported																
30	in the sample result section. % REC - Percent Recovery. Calculated as the percentage of the results to																
	the true value. It equals to % recovery for CCC.																
	2. "-" denotes that the information is not available or the analyte is not analyzed.																

	Henry's Law Constants Used for the Calculations (atm/mol fraction)					
	Sample	T °C	Methane	Ethane	Propane	n-Butane
	Trip Blank	23	38,276	28,182	34,579	42,130
	Blank	23	38,276	28,182	34,579	42,130
	Field Blank	23	38,276	28,182	34,579	42,130

	6/27/2011		6/28/2011
	Analytical Queue		Analytical Queue
	Argon Blank		Argon Blank
	Argon Blank		Argon Blank
	Argon Blank		Argon Blank
	H2O Blank		H2O Blank
	Refinery Gas		Refinery Gas
	Refinery Gas QC		Refinery Gas QC
	Argon Blank		Argon Blank
	Argon Blank		Argon Blank
	Argon Blank		Argon Blank
	Trip Blank 6030-9		Trip Blank 6030-15
	Argon Blank		Argon Blank
	Argon Blank		Argon Blank
	Argon Blank		Argon Blank
	Field Blank 6032-5		Refinery Gas
	Argon Blank		Argon Blank
	Argon Blank		Argon Blank
	Argon Blank		Argon Blank
	Refinery Gas		
	Argon Blank		
	Argon Blank		
	Argon Blank		